FIG.1

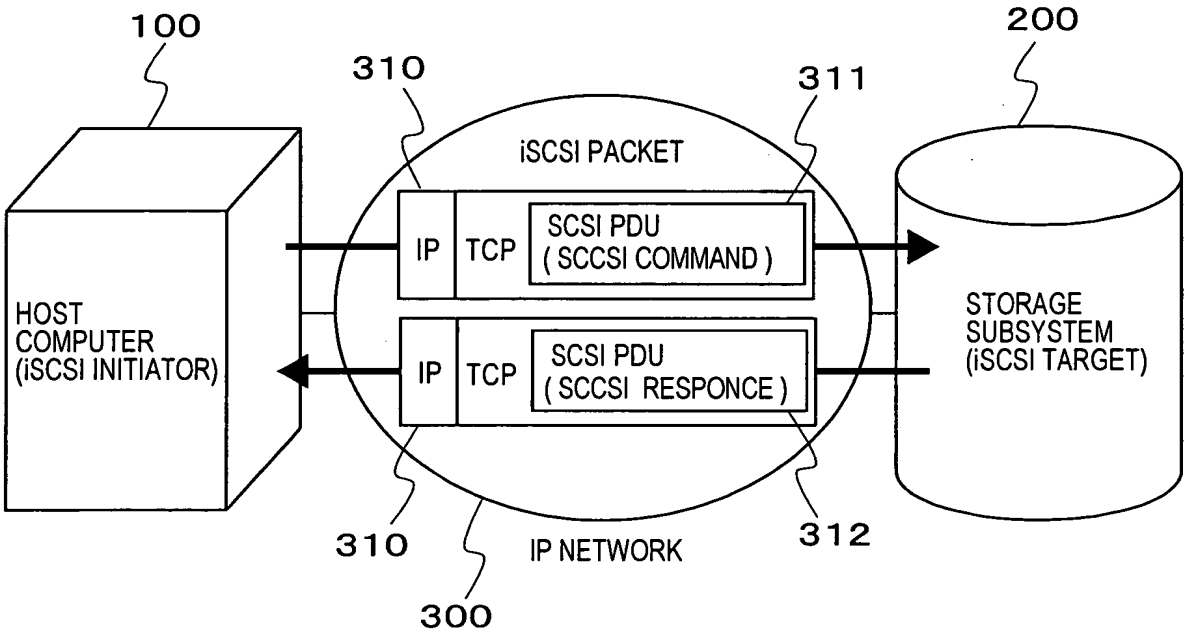

100
310
311
200
iSCSI PACKET
IP
TCP
SCSI PDU
(SCCSI COMMAND)
HOST
COMPUTER
(iSCSI INITIATOR)
IP
TCP
SCSI PDU
(SCCSI RESPONCE)
STORAGE
SUBSYSTEM
(iSCSI TARGET)
310
IP NETWORK
312
300

FIG.2

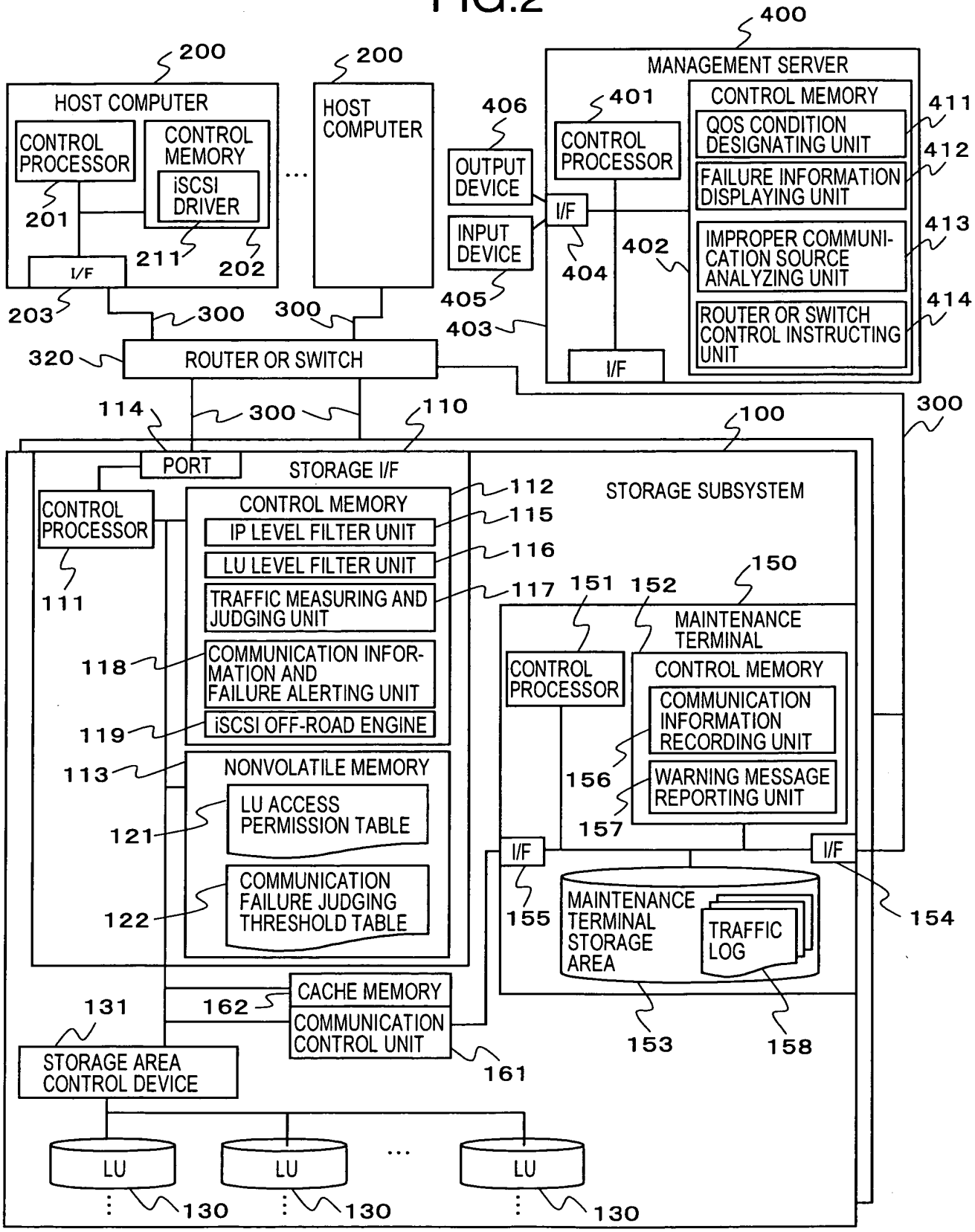

400
MANAGEMENT SERVER
401
CONTROL PROCESSOR
CONTROL MEMORY
411
QOS CONDITION DESIGNATING UNIT
412
FAILURE INFORMATION DISPLAYING UNIT
413
IMPROPER COMMUNICATION SOURCE ANALYZING UNIT
414
ROUTER OR SWITCH CONTROL INSTRUCTING UNIT
406
OUTPUT DEVICE
INPUT DEVICE
I/F
404
402
405
403
I/F
200
HOST COMPUTER
CONTROL PROCESSOR
CONTROL MEMORY
iSCSI DRIVER
201
211
202
I/F
203
200
HOST COMPUTER
300
300
320
ROUTER OR SWITCH
300
114
300
110
100
PORT
STORAGE I/F
CONTROL PROCESSOR
111
CONTROL MEMORY
112
IP LEVEL FILTER UNIT
115
LU LEVEL FILTER UNIT
116
TRAFFIC MEASURING AND JUDGING UNIT
117
118
COMMUNICATION INFORMATION AND FAILURE ALERTING UNIT
119
iSCSI OFF-ROAD ENGINE
113
NONVOLATILE MEMORY
121
LU ACCESS PERMISSION TABLE
122
COMMUNICATION FAILURE JUDGING THRESHOLD TABLE
STORAGE SUBSYSTEM
150
151
152
MAINTENANCE TERMINAL
CONTROL PROCESSOR
CONTROL MEMORY
COMMUNICATION INFORMATION RECORDING UNIT
156
WARNING MESSAGE REPORTING UNIT
157
I/F
155
I/F
154
MAINTENANCE TERMINAL STORAGE AREA
TRAFFIC LOG
153
158
CACHE MEMORY
162
COMMUNICATION CONTROL UNIT
161
131
STORAGE AREA CONTROL DEVICE
LU
LU
LU
130
130
130

FIG.3

1211 iSCSI NAME	1212 VIRTUAL LUN	1213 LUN
Iqn .2003-07.com.XXX :iscsi-disk :mdel-YYY :sn-ZZZ	0,1,2,3,4	0,1,6,8,15
Iqn .2003-07.com.RRR :iscsi-disk :mdel-SSS :sn-TTT	0,1,2	2,7,10
Iqn .2003-07.com.OOO :iscsi-disk :mdel-PPP :sn-QQQ	0,1,2,3	3,4,5,14
⋮	⋮	⋮

121

FIG.4

	122 a JUDGING OBJECT COMMUNICATION RATIO	122 b THRESHOLD
1221	NON-iSCSI PACKET TRAFFIC (/s)/ALL TRAFFIC (/S)	50% OR MORE
1222	UNPERMITTED iSCSI PACKET TRAFFIC (/S) / iSCSI PACKET ALL TRAFFIC (/S)	30% OR MORE
1223	PERMITTED iSCSI PACKET TRAFFIC (/S) / ALL TRAFFIC (/S)	60% OR LESS
	⋮	⋮

122

FIG.5

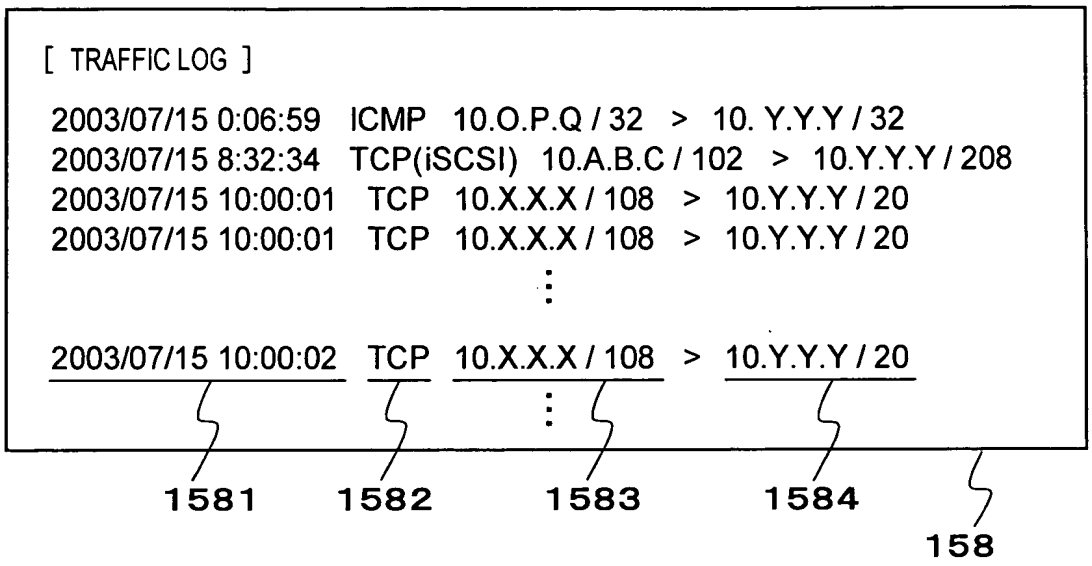

[TRAFFIC LOG]
2003/07/15 0:06:59 ICMP 10.O.P.Q / 32 > 10. Y.Y.Y / 32
2003/07/15 8:32:34 TCP(iSCSI) 10.A.B.C / 102 > 10.Y.Y.Y / 208
2003/07/15 10:00:01 TCP 10.X.X.X / 108 > 10.Y.Y.Y / 20
2003/07/15 10:00:01 TCP 10.X.X.X / 108 > 10.Y.Y.Y / 20
2003/07/15 10:00:02 TCP 10.X.X.X / 108 > 10.Y.Y.Y / 20
1581
1582
1583
1584
158

FIG.6

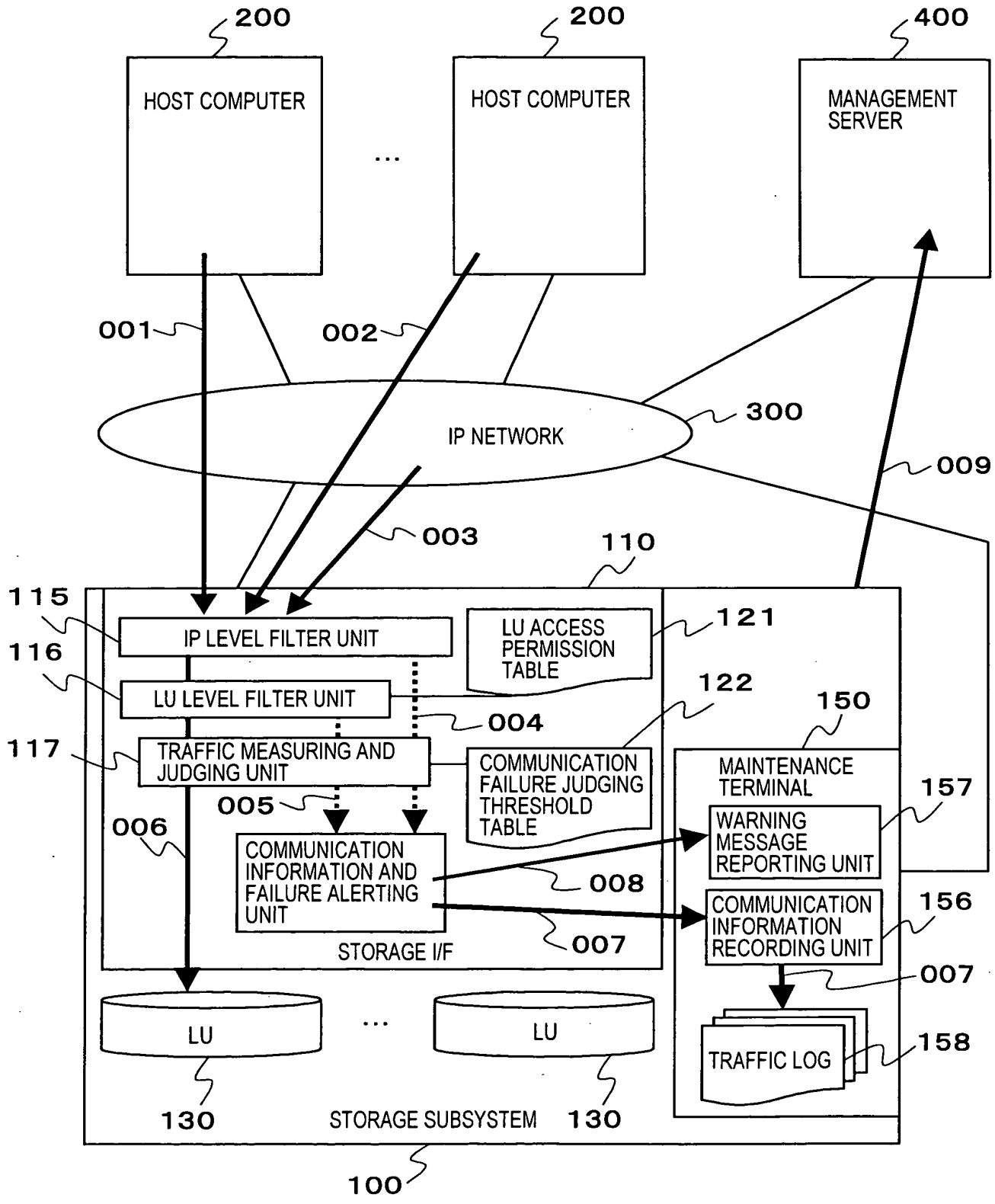

200
HOST COMPUTER
200
HOST COMPUTER
400
MANAGEMENT SERVER
001
002
IP NETWORK
300
009
003
110
115
IP LEVEL FILTER UNIT
116
LU LEVEL FILTER UNIT
117
TRAFFIC MEASURING AND JUDGING UNIT
LU ACCESS PERMISSION TABLE
121
122
004
COMMUNICATION FAILURE JUDGING THRESHOLD TABLE
150
MAINTENANCE TERMINAL
157
005
006
COMMUNICATION INFORMATION AND FAILURE ALERTING UNIT
008
WARNING MESSAGE REPORTING UNIT
156
COMMUNICATION INFORMATION RECORDING UNIT
007
007
STORAGE I/F
LU
LU
TRAFFIC LOG
158
130
STORAGE SUBSYSTEM
130
100

FIG.7

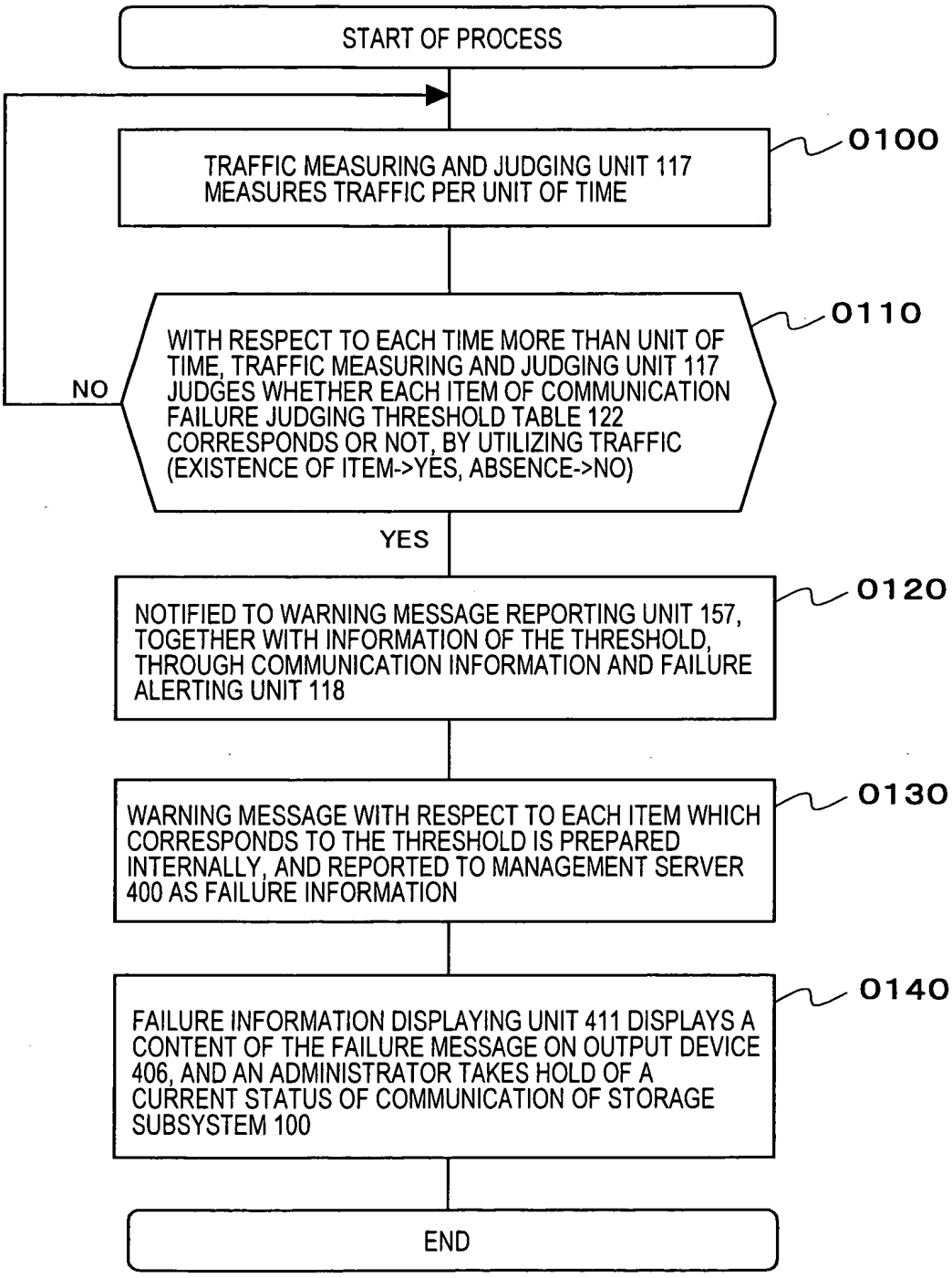

START OF PROCESS
TRAFFIC MEASURING AND JUDGING UNIT 117 MEASURES TRAFFIC PER UNIT OF TIME
0100
WITH RESPECT TO EACH TIME MORE THAN UNIT OF TIME, TRAFFIC MEASURING AND JUDGING UNIT 117 JUDGES WHETHER EACH ITEM OF COMMUNICATION FAILURE JUDGING THRESHOLD TABLE 122 CORRESPONDS OR NOT, BY UTILIZING TRAFFIC (EXISTENCE OF ITEM->YES, ABSENCE->NO)
0110
NO
YES
NOTIFIED TO WARNING MESSAGE REPORTING UNIT 157, TOGETHER WITH INFORMATION OF THE THRESHOLD, THROUGH COMMUNICATION INFORMATION AND FAILURE ALERTING UNIT 118
0120
WARNING MESSAGE WITH RESPECT TO EACH ITEM WHICH CORRESPONDS TO THE THRESHOLD IS PREPARED INTERNALLY, AND REPORTED TO MANAGEMENT SERVER 400 AS FAILURE INFORMATION
0130
FAILURE INFORMATION DISPLAYING UNIT 411 DISPLAYS A CONTENT OF THE FAILURE MESSAGE ON OUTPUT DEVICE 406, AND AN ADMINISTRATOR TAKES HOLD OF A CURRENT STATUS OF COMMUNICATION OF STORAGE SUBSYSTEM 100
0140
END

FIG.8

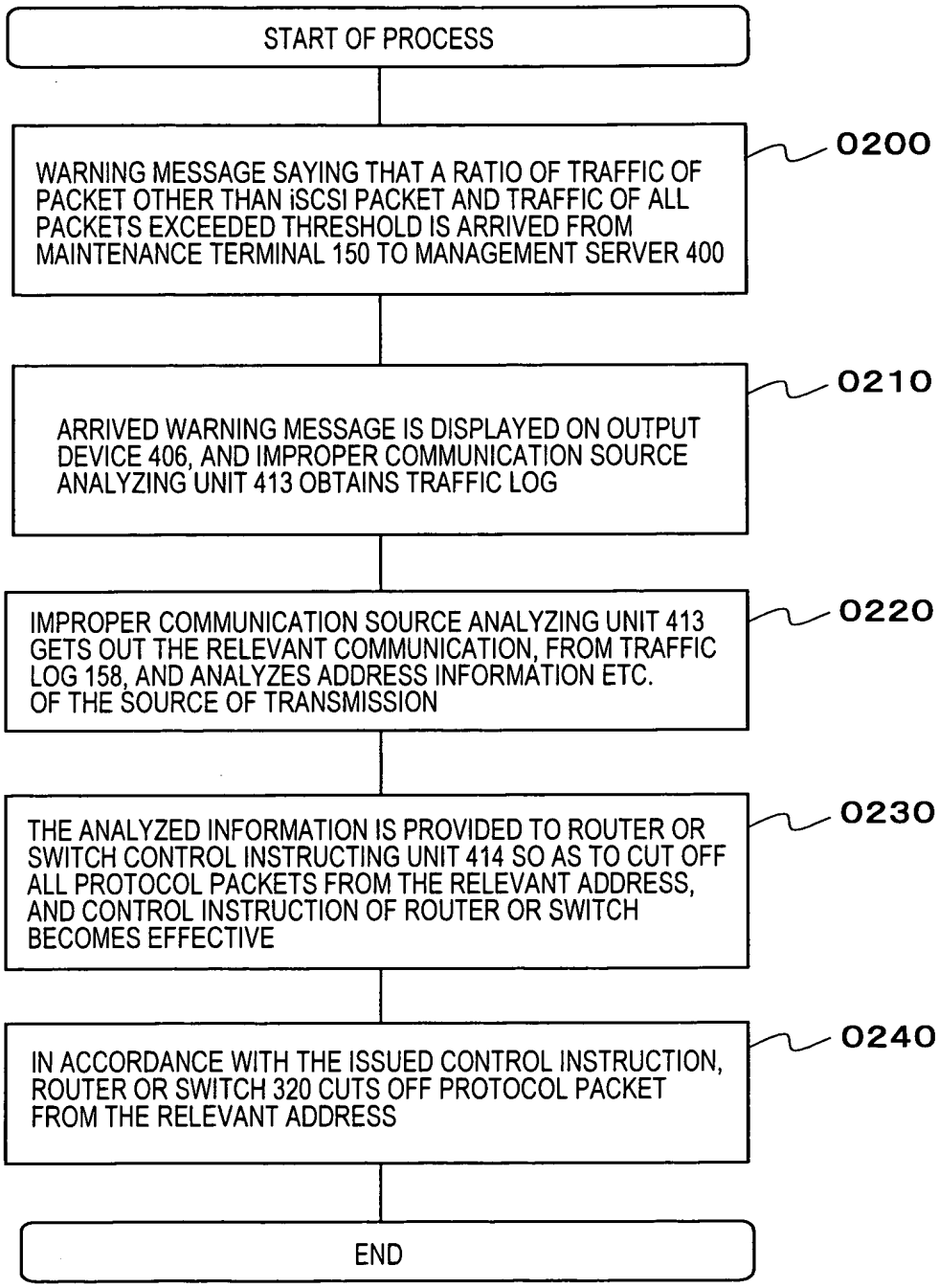
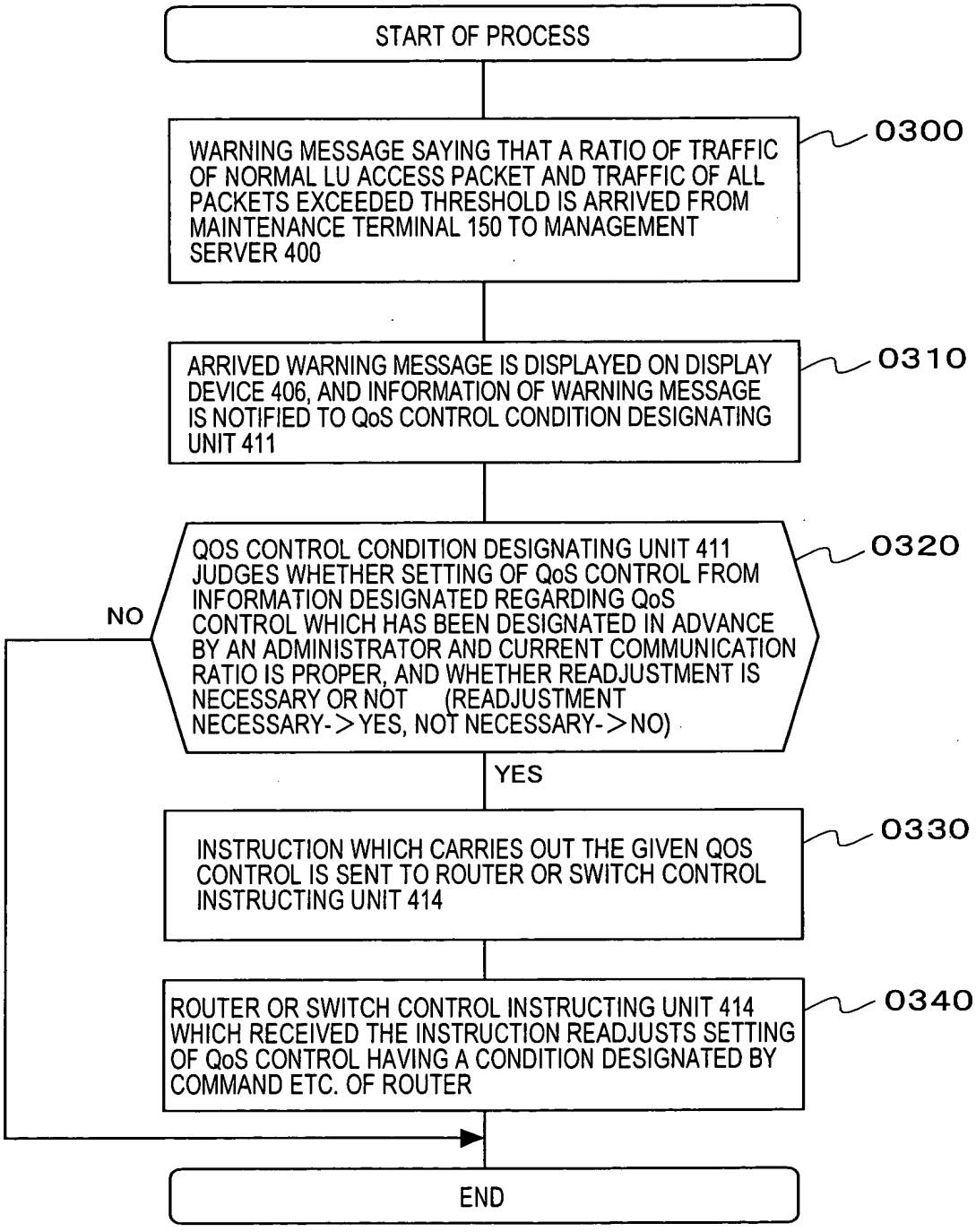

START OF PROCESS
WARNING MESSAGE SAYING THAT A RATIO OF TRAFFIC OF PACKET OTHER THAN iSCSI PACKET AND TRAFFIC OF ALL PACKETS EXCEEDED THRESHOLD IS ARRIVED FROM MAINTENANCE TERMINAL 150 TO MANAGEMENT SERVER 400
0200
ARRIVED WARNING MESSAGE IS DISPLAYED ON OUTPUT DEVICE 406, AND IMPROPER COMMUNICATION SOURCE ANALYZING UNIT 413 OBTAINS TRAFFIC LOG
0210
IMPROPER COMMUNICATION SOURCE ANALYZING UNIT 413 GETS OUT THE RELEVANT COMMUNICATION, FROM TRAFFIC LOG 158, AND ANALYZES ADDRESS INFORMATION ETC. OF THE SOURCE OF TRANSMISSION
0220
THE ANALYZED INFORMATION IS PROVIDED TO ROUTER OR SWITCH CONTROL INSTRUCTING UNIT 414 SO AS TO CUT OFF ALL PROTOCOL PACKETS FROM THE RELEVANT ADDRESS, AND CONTROL INSTRUCTION OF ROUTER OR SWITCH BECOMES EFFECTIVE
0230
IN ACCORDANCE WITH THE ISSUED CONTROL INSTRUCTION, ROUTER OR SWITCH 320 CUTS OFF PROTOCOL PACKET FROM THE RELEVANT ADDRESS
0240
END

FIG.9


START OF PROCESS
WARNING MESSAGE SAYING THAT A RATIO OF TRAFFIC OF NORMAL LU ACCESS PACKET AND TRAFFIC OF ALL PACKETS EXCEEDED THRESHOLD IS ARRIVED FROM MAINTENANCE TERMINAL 150 TO MANAGEMENT SERVER 400
0300
ARRIVED WARNING MESSAGE IS DISPLAYED ON DISPLAY DEVICE 406, AND INFORMATION OF WARNING MESSAGE IS NOTIFIED TO QoS CONTROL CONDITION DESIGNATING UNIT 411
0310
QOS CONTROL CONDITION DESIGNATING UNIT 411 JUDGES WHETHER SETTING OF QoS CONTROL FROM INFORMATION DESIGNATED REGARDING QoS CONTROL WHICH HAS BEEN DESIGNATED IN ADVANCE BY AN ADMINISTRATOR AND CURRENT COMMUNICATION RATIO IS PROPER, AND WHETHER READJUSTMENT IS NECESSARY OR NOT (READJUSTMENT NECESSARY->YES, NOT NECESSARY->NO)
0320
NO
YES
INSTRUCTION WHICH CARRIES OUT THE GIVEN QOS CONTROL IS SENT TO ROUTER OR SWITCH CONTROL INSTRUCTING UNIT 414
0330
ROUTER OR SWITCH CONTROL INSTRUCTING UNIT 414 WHICH RECEIVED THE INSTRUCTION READJUSTS SETTING OF QoS CONTROL HAVING A CONDITION DESIGNATED BY COMMAND ETC. OF ROUTER
0340
END